Daniel W. Folan, Ph.D., PG, LSP

Senior Hydrogeologist and Licensed Site Professional

Education:

PhD, Geochemistry, Colorado School of Mines

BS, Chemistry/Geology - Double Major, Bridgewater State College

Registrations:

Licensed Site Professional, MA

Licensed Environmental Professional, CT

Professional Geologist, IN

Professional Geologist, ME

Professional Geologist, NH

Years of Experience:

With AECOM 15

With US Geological Survey 2

With other firms 11

Technical Specialties:

Fractured Rock Characterization

Groundwater & Soil Subsurface Investigation

Chlorinated VOCs

Remedial Fate & Transport Modeling

Professional Affiliations:

Licensed Site Professional

Geological Society of Maine

National Groundwater Association

New Hampshire Council of Professional Geologists

Training and

Dr. Folan is a former employee of the US Geological Survey and is currently a certified Professional Geologist and Licensed Site Professional with 28 years of experience in the environmental industry, specializing in hydrogeological investigations and contaminant geochemistry. He has managed and served as technical specialist on more than 300 hazardous waste management and remediation projects. Dr. Folan is knowledgeable in all methods of hydrogeologic investigation and has particular expertise in the characterization of fractured bedrock aquifers impacted with DNAPL and chlorinated solvent sites. Dr. Folan's experience with groundwater flow modeling and contaminant fate/transport analysis enables him to provide CSM development expertise that can be used in litigation support, data gap evaluation, risk assessments and remedial design. Dr. Folan has established working relationships with Dr. John Cherry and Dr. Beth Parker at the University of Guelph, Ontario. Dr. Folan is also currently working with Dr. Bernie Kueper of Queen's University on a DNAPL-impacted fractured bedrock site.

Select DNAPL Site Experience

Confidential Aerospace Manufacturing Client, Federal Superfund Site, PCB DNAPL Plume Delineation and Recovery, Lynn, Massachusetts. Managed site investigation that included a soil boring program to delineate separate phase PCB plume covering an area of approximately 500,000 square feet. PCB DNAPL was observed beneath the footprint of an active manufacturing facility and extended out beneath the adjacent parking lot. The presence of the PCB DNAPL triggered a 72-Hour Notification Condition and an Immediate Response Action (IRA) was conducted. The nature and extent of the plume was subsequently delineated and recovery efforts were initiated. Recovery efforts entailed the operation of belt skimmers within 4-inch recovery wells installed throughout the plume, include the building. DNAPL recovery over a period of eight months had significantly reduced the plume thickness and extent.

Creosote Production Facility, Hydrogeologic Investigation of Fractured Karst Aquifer, Dolomite, Alabama. Project Hydrogeologist/Technical Advisor for a RCRA Facility Investigation and a Groundwater Corrective Action Program at an active coal tar/creosote production facility located in northern Alabama. The 100-acre site is located in the valley and ridge province of the southern Appalachians. Developed CSM for the complex geological system that consists of dissolved phase coal tar and creosote in fractured dolomite with karst features. Prepared RFI and focused groundwater investigation work plans. The groundwater investigation included implementation of fracture trace analysis, borehole geophysics, dye tracer study, geochemical fingerprinting, stream gauging, biodegradation potential, and statistical trend analysis. This information was used to successfully support an ACL Petition for groundwater protection standards.

Aerospace Manufacturing Facility, Eastern, Massachusetts. Licensed Site Professional (LSP) and Sr. Hydrogeologist for supplemental investigation at the former GE Aerospace facility to complete delineation of source areas. Site is impacted with historical DNAPL in the form of chlorinated solvents in fractured crystalline bedrock. Investigative work involved geophysical survey,

Certifications:

40-hour OSHA HAZWOPER Training

8-hour OSHA HAZWOPER Refresher Training

soil and groundwater sampling, rotosonic drilling, rock core VOC analysis, and vapor intrusion studies which required coordination with property owner and tenant. Conducted an exhaustive review of existing data and prepared an updated conceptual site model (CSM). Played key role in design of supplemental investigation of fractured bedrock and downgradient sand & gravel aquifer. Also responsible for interfacing with the MassDEP, preparation of MCP regulatory submittals and public involvement requirements.

National Railroad Client, DNAPL in Fractured Carbonate Aquifer RFI/CMS, Burlington, Iowa. Lead hydrogeologist and geochemist for abandoned railroad site that is currently regulated under RCRA. The 200-acre site is impacted with chlorinated solvents, primarily PCE within a fractured carbonate aquifer. PCE in the form of DNAPL has been confirmed at the base of the fractured bedrock aquifer at a depth of 150 feet. The PCE plume extends for approximately ½-mile within the carbonate aquifer. Developed a CSM that describes the source area, nature and extent of PCE in groundwater, likely migration pathways, and degradation products. Subsequently designed a supplemental investigation to support the Corrective Measures Study evaluation of remedial alternatives that included air rotary, bedrock coring, DNAPL screening with reactive FLUTe liners, borehole geophysics, rock core VOC analysis, extraction well design, 77-hour pumping test, multi-port FLUTe liners, and groundwater sampling. Also designed a groundwater-surface water study to evaluate potential discharge of impacted bedrock groundwater to a shallow surface water drainage using streambed temperature probes, passive vapor diffusion samplers, and trapezoidal flumes to measure stream flow.

Energy Utility Client, Former MGP Site, Central Massachusetts. Project Manager for MCP Supplemental Phase II Investigation, Method 3 Risk Assessment, and Phase III Remedial Action Plan for a former MGP site. Designed and directed field investigation for a 24 acre site that included: test pit excavations, installation of soil borings and multi-cased monitoring wells, fracture orientation measurements in local outcrops, bedrock coring, surface and borehole geophysics, packer testing, DNAPL screening using UVF, sediment survey, and sampling and analysis of soil, groundwater, sediments, surface water and NAPL. The bedrock at the site consisted of a fractured granite that was impacted with coal tar DNAPL and the fractures were shown to be a pathway for coal tar seeps discharging to the adjacent river. In addition to tar seeps along the river, the Phase II Report indicated that several exceedences of UCLs were identified in soil and groundwater. The Method 3 Risk Assessment determined that the tar seeps represented a significant risk. The potential human health exposure pathways to impacted groundwater were incomplete. The Phase III Remedial Action Plan presented an evaluation of several remedies to address the tar seeps, including a slurry wall and NAPL interceptor trench and several soil remedial alternatives, including soil excavation, solidification, and capping. Responsible for preparation of all work plans and Supplemental Phase II Report.

Confidential Aerospace Manufacturer, DNAPL in Fractured Dolomite Site Supplemental Remedial Investigation, Illinois. Lead hydrogeologist and geochemist for investigation and remediation activities associated with an active aerospace manufacturing facility impacted with chlorinated solvents. Trichloroethane (TCA) and associated degradation products are present in dissolved form and as DNAPL in a fractured dolomite aquifer. Synthesized

geologic, geophysical, hydrogeologic and geochemical data from previous investigations. Developed a CSM that described the source area, nature and extent of TCA, fractured rock characteristics, groundwater flow, likely migration pathways, and degradation products. Conducted fracture fabric analysis at local rock quarries to identify fracture patterns in the area. Designed a supplemental remedial investigation that included air rotary drilling, bedrock coring, DNAPL screening with reactive FLUTe liners, packer testing, borehole geophysics, rock core VOC analysis, extraction well design, pumping test, permanent multi-port FLUTe liner installation, and groundwater sampling. Bedrock wells were designed for depths up to 200 feet below ground surface and for multilevel sampling.

Federal Defense Facility, DNAPL Chlorinated Solvent Investigation in Bedrock, NJ. Sr. Hydrogeologist and Geochemist for supplemental investigation of a DNAPL chlorinated solvent release to bedrock groundwater. The Site is on the edge of a hill and is impacted with PCE, TCE and 1,1,1-TCA in overburden and bedrock. The solvents are suspected of impacting downgradient private bedrock residential wells screened in the Passaic Formation. Evaluated existing site data collected by others and prepared a conceptual site model describing the groundwater flow pathways both horizontally and vertically. Due to near-vertical fractures resulting from inherent expansion joints in the underlying Passaic Formation, steep vertical hydraulic gradients are present in the bedrock at the site. Consequently designed a detailed protocol for subsequent bedrock borehole geophysics and groundwater screening. The groundwater screening was to be conducted by others using a straddle-packer system. Recommended temporary bedrock borehole sealing using either a FLUTe liner or packers to minimize intra-borehole flow and potential cross-contamination.

DNAPL Presence Evaluation Using Partitioning Calculations, Burlington, Iowa.
Senior Geochemist that evaluated the presence of chlorinated solvent DNAPL using soil partitioning software program called NAPL Calculator (formerly NAPLator). The NAPL Calculator program runs calculation #1 through #6 found in the USEPA document entitled "*Assessment and Delineation of DNAPL Source Zones*", prepared by Kueper and Davies in 1990 (EPA EPA/600/R-09/119). The NAPL Calculator program was used to determine if separate phase DNAPL may be present in soil and groundwater at the site. Data input included soil porosity, fraction organic carbon and concentrations of individual organic compounds in soil. For selected areas of the site, the residual saturation, mass of the DNAPL in the sample, and mass balance and phase distribution of each chemical composing the DNAPL was predicted. This information was used to assist in describing the presence/absence of DNAPL in these areas of the site.

DNAPL Mobility Evaluation, National Railroad Client, Former Creosote Tie Treating Plant, Minnesota. Senior Geochemist that managed a DNAPL mobility evaluation for a former creosote tie treating plant. From approximately 1907 to 1986, the plant used creosote and fuel oil mixtures to preserve railroad ties. Wastewaters from the wood preserving operation were sent to two shallow, unlined surface impoundments for disposal, resulting in soil and groundwater impacted with creosote and fuel oil. Creosote DNAPL impacted the underlying glaciofluvial deposits and was observed at depths of at least 100 feet below the water table. The mobility assessment included the use of high resolution site characterization techniques involving direct push technologies such as TARGOST, MIP, EC and HPT. In addition, the assessment included the collection

of DNAPL-impacted soil samples and frozen soil cores for analysis of specialized mobility-related parameters. The results were used to support the conclusion that creosote DNAPL present at the site had micro-scale mobility (could flow into a nearby well), however, the DNAPL lacked macro-scale mobility and was not considered to be a potential threat for further migration.

Select Groundwater Flow Modeling and Fate and Transport Experience

Groundwater Modeling and Fate and Transport, State Superfund Site, MA. Sr. Hydrogeologist for Phase II remedial investigation and groundwater flow and solute transport modeling in support of an RI/FS prepared for an abandoned dumping (CERCLA) site. Directed field activities involving soil borings, bedrock coring, fracture trace analysis, vertical profile groundwater sampling, on-site gas chromatograph analysis, installation of monitoring wells, and pneumatic slug testing. Evaluated large scale (300+ gpm) pumping test results performed in the area by another party. Responsible for groundwater flow model (MODFLOW) conceptual design, calibration, sensitivity analyses, and simulations. The model was used to develop and optimize remedial action alternative evaluations in the overburden and fractured bedrock aquifers. Flow model results were evaluated with a particle tracking model (MODPATH) to determine optimal capture zones and travel-times of advective groundwater flow. Concentrations and time to achieve cleanup levels in both the overburden and fractured bedrock aquifers were determined using a solute transport model (MT3D).

Contaminated Bedrock Aquifer, Eastern MA. Senior Hydrogeologist for a hydrogeologic investigation and groundwater modeling for an active industrial site located adjacent to a large wetlands and within a buried glacial/fractured bedrock valley in eastern Massachusetts. Responsibilities included preparation of a hydrogeological atlas, resistivity survey, soil boring/bedrock coring, fracture trace analysis, packer testing, borehole geophysics, monitoring well installation, potentiometric survey, and groundwater/solute transport modeling. A groundwater flow model (MODFLOW) was used to develop and optimize remedial action alternatives within the overburden and bedrock aquifers. The interaction of ground water with the wetlands surface water was simulated to ensure that groundwater removal would not dewater the wetlands. Flow model results were evaluated with a particle tracking model (MODPATH) to determine optimal capture zones and travel-times of advective groundwater flow.

Groundwater Modeling and Fate and Transport, Former MGP Site, IN. Project Manager for Remedial Investigation, Groundwater Modeling and Feasibility Study of a former MGP site. Designed and directed comprehensive remedial investigation undertaken to define the nature and extent of contamination. Activities involved installation of soil borings, installation of multi-cased wells through confining layers, potentiometric survey, DNAPL screening, slug testing, and sampling and analysis of soil, groundwater, surface water, and sediments. Conducted the groundwater flow (MODFLOW) and solute transport (BIOMOD) modeling of the dissolved PAH plume. The solute transport modeling supported the field observations in that the dissolved PAH plume is undergoing natural attenuation via aerobic biodegradation. The simulations also show that the plume is no longer expanding and has reached steady-state conditions. This information was used to support a natural attenuation argument in the proposed Risk Assessment and Feasibility Study.